Expedited Procedure
Examining Group 2813

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Cyril Cabral, Jr. et al.	**Examiner:**	Erik J. Kielin
Serial No:	10/827,064	**Art Unit:**	2813
Filed:	April 19, 2004	**Docket:**	YOR919990509US3 (13171AB)
For:	METHOD AND STRUCTURE FOR REDUCTION OF CONTACT RESISTANCE OF METAL SILICIDES USING A METAL-GERMANIUM ALLOY	**Dated:**	July 8, 2005

Confirmation No. 2363

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE UNDER 37 C.F.R. § 1.116

Sir:

In response to the final Office Action dated May 19, 2005, Applicants hereby submit the following amendments and remarks for entry of record in the above-identified patent application.

CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that this document is being filed in the United States Patent and Trademark Office on the date shown below via facsimile transmission to Mail Stop AF, Commissioner for Patents, PO Box 1450, Alexandria, VA 22313-1450 at United States Patent and Trademark Office facsimile transmission number (703) 872-9306.

Dated: July 8, 2005

Leslie S. Szivos, Ph.D.

SECTION I. (AMENDMENTS TO THE CLAIMS)

A listing of claims 1-32 of the present application, with markings showing amendments made herein, is provided below:

Claims 1-23 (Cancelled)

Claim 24 (Currently amended) An electrical contact to a region of a silicon-containing substrate comprising a substrate having an exposed region of a silicon-containing semiconductor material; and a first layer of Ni monosilicide, wherein said substrate and said first layer are separated by a Si-Ge interlayer and said first layer of Ni monosilicide comprises ~~0.01 to 50 atomic percent of~~ at least one ~~alloy~~ additive selected from the group consisting of C, Al, ~~Si,~~ Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Tb and Lu.

Claim 25 (Previously presented) The electrical contact of Claim 24 wherein said silicon-containing semiconductor material comprises single crystal Si, polycrystalline Si, SiGe, amorphous Si or a silicon-on-insulator (SOI).

Claims 26-27 (Cancelled)

Claim 28 (Previously presented) The electrical contact of Claim 24 wherein said substrate is doped.

Claim 29 (Previously presented) The electrical contact of Claim 24 wherein said substrate includes a p^+ silicon area.

Claim 30 (Currently amended) The electrical contact of Claim 24 wherein said substrate includes an n^+ silicon area.

Claim 31 (Currently amended). The electrical contact of Claim 24 wherein said at least one ~~alloy~~ additive is C, Al, ~~Si,~~ Sc, Ti, V, Cr, Mn, Fe, Co, Cu, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir or Pt.

Claim 32 (Currently amended) The electrical contact of Claim 31 wherein said at least one additive is ~~Si,~~ Ti, V, Cr, Nb, Rh, Ta, Re or Ir.

REMARKS

Response to Written Description Rejections

In response to the Examiner's rejections of claims 24, 25, and 28-32 under 35 USC §112, first paragraph, for lack of written description in the May 19, 2005 Office action, Applicants have hereby amended claim 24, from which claims 25 and 28-32 depend, to recite:

> "24. An electrical contact to a region of a silicon-containing substrate comprising a substrate having an exposed region of a silicon-containing semiconductor material; and a first layer of Ni monosilicide, wherein said substrate and said first layer are separated by a Si-Ge interlayer and **said first layer of Ni monosilicide comprises at least one additive selected from the group consisting of C, Al, Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Tb and Lu**."

The instant specification describes use of metal germanium alloys as starting materials for fabricating metal silicide contacts (see the paragraph between pages 2 and 3 of the instant specification). More specifically, the instant specification states that "[w]hen Ni is employed as the metal [in the metal germanium alloy layer], Ni monosilicide is formed after a single annealing step" (see page 4, lines 19-20) and that "[t]he metal germanium alloy layer of the present invention may also include at least one additive... selected from the group consisting of C, Al, ..., Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Tb and Lu" (see page 9, lines 7-12).

It is clear that a Ni monosilicide layer formed by annealing a nickel germanium alloy layer that contains one or more additives listed hereinabove also contains such one or more additives.

Therefore, the instant specification provides sufficient description for a Ni monosilicide layer that comprises at least one additive selected from the group consisting of C, Al, Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce,

Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Tb and Lu, as recited by claims 24, 25, and 28-32 of the present application.

Response to the §103 Rejections of Claims 24, 25, and 28-32

In the May 19, 2005 Office Action, the Examiner finalized previous rejections of claims 24, 25, and 28-32 under 35 USC §103(a) as being allegedly obvious over Legoues et al. U.S. Patent No. 5,810,924 (hereinafter "Legoues") or Yoshimi et al. U.S. Patent No. 5,698,869 (hereinafter "Yoshimi"), in view of Besser et al. U.S. Patent No. 6,165,903 (hereinafter "Besser")

Applicants respectfully traverse the Examiner's rejections of such claims, for the following reasons:

Claim 24, from which claims 25 and 28-32 depends, has been amended to positively recite:

> "24. An electrical contact to a region of a silicon-containing substrate comprising a substrate having an exposed region of a silicon-containing semiconductor material; and **a first layer of Ni monosilicide**, wherein said substrate and said first layer are separated by a Si-Ge interlayer and **said first layer of Ni monosilicide comprises at least one additive selected from the group consisting of C, Al, Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Tb and Lu**."

Note that in the amended claim 24, Si has been removed from the list of claimed additives. Correspondingly, claims 31 and 32, which depend from claim 24, have been amended herein to remove Si as one of the claimed additives.

In the May 19, 2005 Office Action, the Examiner expressly conceded that neither of the two primary references Legoues and Yoshimi teaches or suggests a Ni monosilicide layer, but attempted to remedy such a deficiency of the primary references by citing the secondary reference Besser, which discloses a NiSi layer.

However, nothing in Besser teaches or suggests a NiSi layer with an additive selected from the group consisting of C, Al, Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Tb and Lu.

Therefore, the hypothetical combination of **Legoues, Yoshimi** and **Besser**, as suggested by the Examiner in the May 19, 2005 Office Action, still fails to provide any basis for a Ni monosilicide layer containing at least one additive selected from the group consisting of C, Al, Sc, Ti, V, Cr, Mn, Fe, Co, Y, Zr, Nb, Mo, Ru, Rh, Pd, In, Sn, La, Hf, Ta, W, Re, Ir, Pt, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Tb and Lu, as positively recited by claims 24, 25, and 28-32 of the present application.

Thus, claims 24, 25, and 28-32 as amended herein are patentably distinguished over the cited references, and Applicants hereby request the Examiner to reconsider, and upon reconsideration to withdraw, the rejections of claims 24, 25, and 28-32.

CONCLUSION

Based on the foregoing, claims 24, 25, and 28-32, as amended herein and now pending in the application, are in form and condition for allowance. Issue of a Notice of Allowance for the application is therefore requested.

If any issues remain outstanding, incident to the formal allowance of the application, the Examiner is requested to contact the undersigned attorney at (516) 742-4343 to discuss same, in order that this application may be allowed and passed to issue at an early date.

Respectfully submitted,

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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	10/827,064
Filing Date	April 19, 2004
First Named Inventor	Cyril Cabral, Jr.
Art Unit	2813
Examiner Name	Erik J. Kielin
Attorney Docket Number	YOR919990539US3 (13171AB)

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 CFR 1.114 Note: If the RCE is proper, any previously filed unentered and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

a. ☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.
   - ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on
   - ☒ Other The amendments and arguments to the July 8, 2005 Response.

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b. ☐ Enclosed
   - i. ☐ Amendment/Reply
   - ii. ☐ Affidavit(s)/Declaration(s)
   - iii. ☐ Information Disclosure Statement (IDS)
   - iv. ☐ Other

2. Miscellaneous
   a. ☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of ____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)
   b. ☐ Other

3. Fees The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.
   a. ☒ The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments to Deposit Account No. 50-0510/IBM. I have enclosed a duplicate copy of this sheet.
      - i. ☒ RCE fee required under 37 CFR 1.17(e)
      - ii. ☐ Extension of time fee (37 CFR 1.136 and 1.17)
      - iii. ☐ Other
   b. ☐ Check in the amount of $ ____ enclosed
   c. ☐ Payment by credit card (Form PTO-2038 enclosed)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Signature		Date	August 1, 2005
Name (Print / Type)	Leslie S. Szivos, Ph.D.	Registration No.	39,394

CERTIFICATE OF MAILING OR TRANSMISSION

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CERTIFICATE OF TRANSMISSION BY FACSIMILE (37 CFR 1.8)

Applicant(s): Cyril Cabral, Jr., et al.

Docket No: YOR919990509US3 (13171AB)

Application No.	Filing Date	Examiner	Group Art Unit
10,827,064	April 19, 2004	Erik J. Kielin	2813

Invention: METHOD AND STRUCTURE FOR REDUCTION OF CONTACT RESISTANCE OF METAL SILICIDES USING A METAL-GERMANIUM ALLOY

I hereby certify that this Request for Continued Examination Transmittal
(Identify type of correspondence)
is being facsimile transmitted to the United States Patent and Trademark Office (Fax. No. 703-872-9306

on August 1, 2005
(Date)

Leslie S. Szivos, Ph.D.
(Typed or Printed Name of Person Signing Certificate)

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